

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Alan F. Jankowski et al.

Application No.: 10/612,226

Group No.: 1795

Filed: 07/01/2003

Examiner: Lee, Cynthia

For: MEMS-BASED FUEL CELLS WITH INTEGRATED CATALYTIC FUEL PROCESSOR AND METHOD THEREOF

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Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF  
(PATENT APPLICATION--37 C.F.R. § 41.37)

1. Transmitted herewith, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on December 3, 2008.

2. STATUS OF APPLICANT

This application is on behalf of a small entity. A statement was already filed.

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. § 41.20(b)(2), the fee for filing the Appeal Brief is:

small entity	\$270.00
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<b>Appeal Brief fee due</b>	<b>\$270.00</b>
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4. EXTENSION OF TERM

The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136 apply.

Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

5. TOTAL FEE DUE

The total fee due is:

Appeal brief fee	\$270.00
Extension fee (if any)	\$0.00

<b>TOTAL FEE DUE</b>	<b>\$270.00</b>
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6. FEE PAYMENT

Authorization is hereby made to charge the amount of \$270.00 to Deposit Account No. 50-1351 Order No. LLNLP006).

7. FEE DEFICIENCY

If any additional extension and/or fee is required, and if any additional fee for claims is required, charge Deposit Account No. 50-1351 (Order No. LLNLP006).

Date: February 3, 2009

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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appellant	Jankowski et al.	Docket No.	LLNLP006/ IL- 11019
Serial No.	10/ 612,226	Art Unit:	1795
Filed	July 1, 2003	Examiner	LEE, Cynthia K.
Title	MEMS-Based Fuel Cells with Integrated Catalytic Fuel Processor and Method Thereof		

Commissioner for Patents  
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**ATTENTION: Board of Patent Appeals and Interferences**

**APPEAL BRIEF (37 C.F.R. § 41.37)**

This brief is in furtherance of the Notice of Appeal, filed in this case on Dec. 3, 2008.

The fees required under § 1.17, and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains these items under the following headings, and in the order set forth below (37 C.F.R. § 41.37(c)(i)):

- I REAL PARTY IN INTEREST
- II RELATED APPEALS AND INTERFERENCES
- III STATUS OF CLAIMS
- IV STATUS OF AMENDMENTS
- V SUMMARY OF CLAIMED SUBJECT MATTER
- VI GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL
- VII ARGUMENT

VIII CLAIMS APPENDIX

IX EVIDENCE APPENDIX

X RELATED PROCEEDING APPENDIX

The final page of this brief bears the practitioner's signature.

**I REAL PARTY IN INTEREST (37 C.F.R. § 41.37(c)(1)(i))**

The real party in interest in this appeal is Lawrence Livermore National Security, LLC.

## **II RELATED APPEALS AND INTERFERENCES (37 C.F.R. § 41.37(c) (1)(ii))**

With respect to other prior or pending appeals, interferences, or related judicial proceedings that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal, there are no other such appeals, interferences, or related judicial proceedings.

A Related Proceedings Appendix is appended hereto.

### **III STATUS OF CLAIMS (37 C.F.R. § 41.37(c) (1)(iii))**

#### **A. TOTAL NUMBER OF CLAIMS IN APPLICATION**

Claims in the application are: 1-47

#### **B. STATUS OF ALL THE CLAIMS IN APPLICATION**

1. Claims withdrawn from consideration: 30, 45-46
2. Claims pending: 1-13, 28-47
3. Claims allowed: None
4. Claims rejected: 1-13, 28-29, 31-44, 47
5. Claims cancelled: 14-27

#### **C. CLAIMS ON APPEAL**

The claims on appeal are: 1-13, 28-29, 31-44, 47

#### **IV STATUS OF AMENDMENTS (37 C.F.R. § 41.37(c)(1)(iv))**

As to the status of any amendment filed subsequent to final rejection, no amendments to the claims were made. However, an amendment to the specification, presented to address the 35 USC 112, first paragraph rejection and simplify issues on appeal, was not entered.



## **V SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. § 41.37(c)(1)(v))**

With respect to a summary of independent Claim 1, as described, inter alia, in paragraph [00021] and in Fig. 5, an apparatus comprises a fuel cell stack 85 having a pair of electrodes 86, 88 including an anode and a cathode, and a thin film solid oxide electrolyte 87 disposed therebetween. Manifold 82 is coupled to the fuel cell stack for conveying a fuel to the fuel cell stack. Referring to Fig. 11 and paragraph [00038], a fuel processor 212 is coupled to the manifold (via manifold support 908). The fuel processor 212 has a substrate support 213 including at least one channel 204, and a catalyst for reforming the fuel, as described in paragraph [0038]. An electric heater is positioned in at least one location selected from: between the electrodes (see paragraph [00021] and Fig. 3), and along a fuel path at a point upstream from the fuel cell stack (see paragraph [00035] and Fig. 11 element 210) for heating the fuel prior to the fuel reaching the fuel cell stack.

With respect to a summary of dependent Claim 2, reference is made to the description of Claim 1, which is incorporated by reference. Referring to paragraph [00046], a distance between at least one of the anode and the cathode and the catalyst is less than 10 millimeters.

With respect to a summary of dependent Claim 3, reference is made to the description of Claims 1 and 2, which is incorporated by reference. Referring to [00004], the distance is less than 1 millimeter.

With respect to a summary of dependent Claim 7, reference is made to the description of Claim 1, which is incorporated by reference. 7. Referring to [00019], [00038], Fig. 5 and Fig. 11, the fuel cell stack 85, the manifold 82, and the fuel processor 212 together comprise a volume less than 1 liter.

With respect to a summary of dependent Claim 8, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00046], the electrolyte has a thickness less than 10 micrometers.

With respect to a summary of dependent Claim 11, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00045] and [00053], the manifold includes at least one wall comprising silicon.

With respect to a summary of dependent Claim 12, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00049], the manifold comprises a flow passage having at least one dimension less than 5 millimeters.

With respect to a summary of dependent Claim 39, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00013], the manifold comprises an etched silicon-containing substrate.

With respect to a summary of dependent Claim 40, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00017] and [00037], the substrate support is comprised of at least one of glass, ceramic, metal, or silicon.

With respect to a summary of dependent Claim 42, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00038], the catalyst includes at least one of PtRu, CuO, Cu-ZnO, alumina, and Ni.

With respect to a summary of dependent Claim 43, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00035], the electric heater is a resistive heater.

With respect to a summary of dependent Claim 44, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00035] and Fig. 3 element 50, the resistive heater is a thin film heater.

With respect to a summary of dependent Claim 47, reference is made to the description of Claim 1, which is incorporated by reference. Referring to [00046], the electrolyte has a thickness less than 10 micrometers. Referring to [00017] and [00037], the substrate is comprised of at least

one of glass, ceramic, metal, or silicon. Referring to Fig. 11 and [00035], a combustor 210 is thermally coupled to the fuel processor 212, wherein the combustor 210 further comprises an electric heater.

Of course, the above citations are merely examples of the above claim language and should not be construed as limiting in any manner.

**VI GROUND OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. § 41.37(c)(1)(vi))**

Following, under each issue listed, is a concise statement setting forth the corresponding ground of rejection.

Issue # 1: Claims 1-13, 28, 29, 31-44 and 47 have been rejected under 35 USC 112, first paragraph as failing to comply with the written description requirement.

Issue # 2: Claims 1-7, 9, 10, 12, 13, 28, 29, 31, 32, 34, 37, 39-41 have been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955).

Issue # 3: Claims 8 and 47 have been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955) and in still yet further view of Carter (US2003/0232230).

Issue # 4: Claims 11, 39 and 40 have been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955) and in still yet further view of Mallari (US2003/0044674).

Issue # 5: Claim 42 has been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955) and in still yet further view of Sederquist (US2003/0003332).

Issue # 6: Claims 1 and 33 have been rejected under 35 USC 103(a) as being unpatentable over Holladay (US7077643) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955).

Issue # 7: Claims 43 and 44 have been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007) in view of Ito (US5227258) and in yet further view of Keskula (US2004/0151955) and in still yet further view of Shioya (US6777118).

## VII ARGUMENT (37 C.F.R. § 41.37(c)(1)(vii))

The claims of the groups noted below do not stand or fall together. In the present section, appellant explains why the claims of each group are believed to be separately patentable.

### Issue # 1:

Claims 1-13, 28, 29, 31-44 and 47 have been rejected under 35 USC 112, first paragraph as failing to comply with the written description requirement.

#### *Group #1: Claims 1-13, 28, 29, 31-44 and 47*

In the final office action mailed August 5, 2008, claims 1-13, 28, 29, 31-44 and 47 were rejected under 35 USC 112, first paragraph as failing to comply with the written description requirement. Particularly, the Examiner asserted that the limitation "between the electrodes" in claim 1 is not supported by the disclosure.

In Appellants' response filed Oct. 3, 2008, arguments were presented, and an amendment to the specification adding material that was incorporated by reference was presented.

In the Advisory Action mailed Oct. 31, 2008, the Examiner maintained the rejection as well as refused entry of the amendment to the specification.

The rejection of the claims under 35 USC 112, first paragraph is erroneous on at least two grounds. First, the specification as filed included proper and sufficient support for the claimed subject matter. Second, it was improper not to allow the amendment to the specification. Each ground will be addressed in turn.

Regarding the first error, the specification as filed included proper and sufficient support for the claimed subject matter. In the rejection, the Examiner asserts that the limitation "between the electrodes" in claim 1 is not supported by the disclosure. However, as clearly shown in FIG. 3 of the application as originally filed, a heating element 50 is clearly positioned between electrodes 46 and 54.

Note also paragraph 0018: "While not shown the fuel cell stack 65 would include a resistive heater as in Figure 3 integrated within the porous thick film 64 or fuel cell stack 65."

Note also paragraph 0021 as originally filed: "The fuel cell stack 85 includes an electrode 86, an electrolyte 87, an electrode 88, and a heater element, not shown, but which may be constructed as in the Figure 3 embodiment."

These sections as originally filed in combination with Fig. 3 clearly support the claimed "between the electrodes" in the limitation "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack."

In the Advisory Action, the Examiner states that the Specification does not support that the label 50 (in Figure 3) is the heating element. However, looking at Figure 3, in light of the foregoing description, and noting the shape of the layer 50 and the description of Figure 3 as incorporated by reference, it is clear that layer 50 in Figure 3 of the application as filed supports the claimed "between the electrodes" in the limitation "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack."

Moreover, all layers of Fig. 3 are described in detail in US Patent Application Serial number 09/241,159, filed February 4, 1999, assigned to the same assignees and which was incorporated by reference in the present application in paragraph [0003].

See MPEP 608.01(p), which states in pertinent part:

An application as filed must be complete in itself in order to comply with 35 U.S.C. 112. Material nevertheless may be incorporated by reference, *Ex parte Schwarze*, 151 USPQ 426 (Bd. App. 1966). An application for a patent when filed may incorporate "essential material" by reference to (1) a U.S. patent, >or<(2) a U.S. patent application publication, \*\*>which patent or patent application publication does not itself incorporate such essential material by reference. See 37 CFR 1.57(c). Prior to October 21, 2004, Office policy also permitted incorporation by reference to< a pending U.S. application\*\*. [emphasis added]

Note that the filing date of the present application was July 1, 2003, well prior to the rule change. Therefore, the character of layer 50 of Fig. 3 of the present application is supported by the incorporation by reference.

For any of the foregoing reasons, the rejection is improper.

Regarding the second grounds for error, it was improper not to allow the amendment to the specification as submitted in Appellants' response filed Oct. 3, 2008. In the Advisory Action, the Examiner stated that the Specification does not support that the label 50 (in Figure 3) is the heating element.

While the foregoing was deemed sufficient to overcome the rejection, Appellants nonetheless attempted to amend paragraph [0021] of the application as filed to provide a definition for layer 50. Particularly, Appellants sought to make a simple amendment to paragraph [0021], as follows (with reference to Figure 6): "The fuel cell stack 85 includes an electrode 86, an electrolyte 87, an electrode 88, and a heater element, not shown, but which may be constructed as in the Figure 3 embodiment, which shows a heater 50 between electrodes 46 and 54. Continued reference is made to Figure 6."

While the added description is inherent from Fig. 3 and the specification as a whole, reference is made to the description of FIG. 3 in US Patent Application Serial number 09/241,159, filed February 4, 1999, assigned to the same assignees and which was incorporated by reference in the present application in paragraph [0003]. US Patent Application Serial number 09/241,159 clearly indicates that layer 50 in Fig. 3 (in both the present and the referenced applications) is a heater. Reference is again made to MPEP 608.01(p).

Accordingly, the rejection is improper.

Issue # 2:

Claims 1-7, 9, 10, 12, 13, 28, 29, 31, 32, 34, 37, 39-41 have been rejected under 35 USC 103(a) as being unpatentable over Maru (US4365007, hereinafter "Maru") in view of Ito (US5227258, hereinafter "Ito") and in yet further view of Keskula (US2004/0151955, hereinafter "Keskula").

*Group #1: Claims 1, 4-6, 9, 10, 13, 28, 29, 31, 32, 34, 37, 39-41*



In the final office action mailed August 5, 2008, claims 1, 4-6, 9, 10, 13, 28, 29, 31, 32, 34, 37, 39-41 were rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula.

In Appellants' response filed Oct. 3, 2008, arguments were presented.

In the Advisory Action mailed Oct. 31, 2008, the Examiner maintained the rejection.

The analysis of obviousness was set forth in *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966). In order to establish a *prima facie* case of obviousness, three basic criteria must be met:

First, there must be some *suggestion or motivation*, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings of the references. Second, there must be a *reasonable expectation of success*. Finally, the prior art reference or combined references must teach or suggest *all the claim limitations*. *The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art*, and not based on Appellant's disclosure (*In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); *emphasis added*).

Appellants respectfully traverse the rejection as failing the *Graham* test. Specifically, the combination proposed in the rejection fails at least the first and third elements of the *Graham* test.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

In the rejection, the Examiner relies on newly cited Keskula (US2004/0151955) to show the claimed "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack".

However, as clearly shown in Keskula Fig. 1 and paragraphs 0035-0037, the heating element 52 is in the combustor 34, not along a fuel path at a point upstream from the fuel cell

stack for heating the fuel prior to the fuel reaching the fuel cell stack as claimed. As shown in Keskula Fig. 1, effluent from the combustor is used to heat the heat exchanger 14, and then is dumped to the atmosphere. The heat exchanger in turn heats the catalyst of the fuel processor for enhancing the formation of hydrogen gas from feed materials 6 and 8, which is in turn sent to the fuel cell 22 via line 20.

In the Advisory Action mailed Oct. 31, 2008, the Examiner argues that Keskula's heater (Keskula Fig. 1, element 52) heats the combustor 48, the heat from which is used to heat the incoming fuel, and thus is located along a fuel path. Appellants respectfully disagree, and assert that the Examiner fails to consider the plain language of claim 1. Claim 1 requires "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack." Keskula fails to disclose an electric heater in the claimed position.

Consider the following annotated Fig. 1 from Keskula, in which the heating element 52 has been denoted and arrows drawn along the fuel path. Note that the heating element 52 is not along the fuel path. Rather, the heating element 52 is in the combustor 34. Effluent from the combustor is used to heat the heat exchanger 14, and then is dumped to the atmosphere. The heat exchanger in turn heats the catalyst of the fuel processor for enhancing the formation of hydrogen gas from feed materials 6 and 8, which is in turn sent to the fuel cell 22 via line 20.

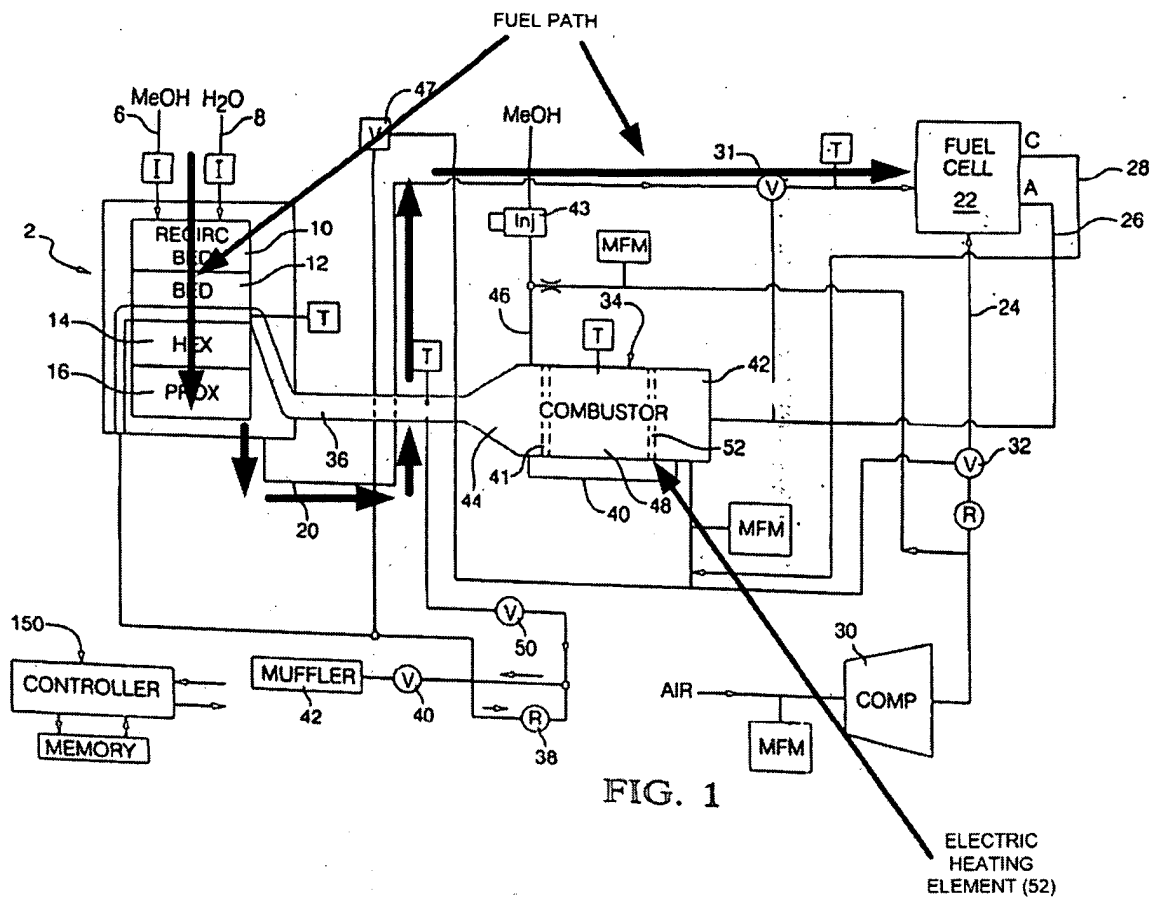


FIG. 1

Accordingly, Keskula's electric heater is not positioned along a fuel path at a point upstream from the fuel cell stack, as claimed. Rather, Keskula's electric heater is in a combustor out of the fuel path, the effluent of which is used to heat a *heat exchanger* along the fuel path.

Thus, not all elements are taught or suggested in the prior art, and the rejection fails the third prong of the *Graham* test.

Appellants also respectfully traverse the rejection of claim 1 as being improper, as it would render Maru's invention unsatisfactory for its intended purpose. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

In the rejection, the Examiner states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to add an electric heater and combustor along the fuel passage of Maru modified by Ito for the benefit of vaporizing the fuel prior to entering the reformer. However, as is clear from Keskula, the purpose of the combustor is to burn fuel. Note Keskula burns MeOH in the combustor, as well as uses MeOH to generate the fuel by catalytic reaction. If Maru's fuel were drawn through Keskula's combustor, the fuel would burn up into combustion byproducts that Maru's reforming catalyst 8 would probably not be able to convert (or "reform") into sufficient quantities of hydrogen.

Accordingly, the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, and there is no suggestion or motivation to make the proposed modification. *In re Gordon, supra*.

Therefore, the rejection is improper.

In the Advisory Action mailed Oct. 31, 2008, the Examiner argues that Keskula's entire heating configuration should be incorporated into Mary. However, such a modification would again result in the heater being positioned far from the fuel path.

The remaining claims in the Group depend from claim 1 and so are believed to be allowable based on their dependence. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

*Group #2: Claims 2, 3, 7*

In the final office action mailed August 5, 2008, claims 2, 3 and 7 were rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula.

In Appellants' response filed Oct. 3, 2008, arguments were presented.

In the Advisory Action mailed Oct. 31, 2008, the Examiner maintained the rejection.

Appellants respectfully traverse the rejection as failing the *Graham* test. Specifically, the combination proposed in the rejection fails at least the first and third elements of the *Graham* test.

The rejection is improper because it fails to consider the dimensional limitations. No showing has been made where the dimensions are found in the art. Accordingly, the rejection fails the third prong of the *Graham* test.

Moreover, there has been no showing of any motivation to select the claimed ranges. Accordingly, the rejection fails the third prong of the *Graham* test.

*Group #3: Claim 12*

In the final office action mailed August 5, 2008, claim 12 was rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula.

In Appellants' response filed Oct. 3, 2008, arguments were presented.

In the Advisory Action mailed Oct. 31, 2008, the Examiner maintained the rejection.

Appellants respectfully traverse the rejection as failing the *Graham* test. Specifically, the combination proposed in the rejection fails at least the first and third elements of the *Graham* test.

Regarding the rejection of claim 12, the Examiner indicates that the claimed dimension is a result effective variable. The courts have held that a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). In the instant case, the Examiner indicates that the size of the flow passage is a result effective variable because the size of the flow passage controls the amount of gas being reformed and the amount of energy generated by the fuel cell.

Appellants respectfully challenge such an assertion, and rather assert that the Examiner's assertion is erroneous on several grounds. First, the amount of gas being reformed and energy generated by the fuel cell is a function of pressure and feed rate rather than of the flow passage size. See, e.g., paragraph [00011] of the present application, which states in pertinent part: "[t]he MEMS processes allow individual control of gas flow to each cell through use of microvalves as well as the ability to control and regulate gas pressure or fuel flow throughout the device." Thus,

regardless of the size of the flow passage, it is the feed rate and pressure that are the result effective variables.

Second, and perhaps more compelling, is that the Examiner's assertion that the size of the flow passage is a result effective variable finds no support in the art of record. Because this feature is not found in the prior art, the rejection of claim 12 relies on official notice. Official notice unsupported by documentary evidence should only be taken by the examiner where the facts asserted to be well-known, or to be common knowledge in the art are capable of instant and unquestionable demonstration as being well-known. As noted by the court in *In re Ahlert*, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970), the notice of facts beyond the record which may be taken by the examiner must be "capable of such instant and unquestionable demonstration as to defy dispute" (citing *In re Knapp Monarch Co.*, 296 F.2d 230, 132 USPQ 6 (CCPA 1961)). It is never appropriate to rely solely on "common knowledge" in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based. *Zurko*, 258 F.3d at 1385, 59 USPQ2d at 1697.

In two of Appellants' responses, filed in January 17, 2008 and on Oct. 3, 2008, Appellant respectfully challenged the taking of official notice, and respectfully asserted that it was not notorious and well known in the art of fuel cells at the time of invention to have flow passages within the claimed dimensions as suggested by the Examiner. As evidence of the erroneous taking of official notice, Appellants pointed to the absence of any mention that the prior art teaches or suggest the claimed dimensions or of controlling a fuel flow rate by passage thickness. To assert that it would have been obvious to construct a flow passage within the claimed range is simply too tenuous an assertion.

Appellants also requested a specific showing in the art of fuel cells of flow control using dimensions of a flow passage, and that met all of the *Graham* criteria, and further that predated Appellants' date of invention. No such showing has been made.

For any of the foregoing reasons, the rejection of claim 12 is improper.

Issue # 3:

Claims 8 and 47 have been rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula and in still yet further view of Carter (US2003/0232230, hereinafter "Carter").

*Group #1: Claims 8, 47*

The rejection applies Maru, Ito and Keskula as for claim 1. As discussed in detail above, the rejection of claim 1 based on Maru, Ito and Keskula is improper, and therefore the deficiency renders the present rejection improper as well.

Claim 1 is also believed to be allowable over the combination of Maru, Ito, Keskula and Carter, as the combination of art fails to teach or suggest all limitations of claim 1.

Claims 8 and 47 depend from claim 1, and therefore incorporate the limitations of claim 1. Accordingly, claims 8 and 47 are believed to be allowable over the combination of art proposed in the rejection.

Issue # 4:

Claims 11, 39 and 40 have been rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula and in still yet further view of Mallari (US2003/0044674, hereinafter "Mallari").

*Group #1: Claims 11, 39, 40*

The rejection applies Maru, Ito and Keskula as for claim 1. As discussed in detail above, the rejection of claim 1 based on Maru, Ito and Keskula is improper, and therefore the deficiency renders the present rejection improper as well.

Claim 1 is also believed to be allowable over the combination of Maru, Ito, Keskula and Mallari, as the combination of art fails to teach or suggest all limitations of claim 1.

Claims 11, 39 and 40 depend from claim 1, and therefore incorporate the limitations of claim 1. Accordingly, claims 11, 39 and 40 are believed to be allowable over the combination of art proposed in the rejection.

Issue # 5:

Claim 42 has been rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula and in still yet further view of Sederquist (US2003/0003332, hereinafter "Sederquist").

*Group #1: Claim 42*

The rejection applies Maru, Ito and Keskula as for claim 1. As discussed in detail above, the rejection of claim 1 based on Maru, Ito and Keskula is improper, and therefore the deficiency renders the present rejection improper as well.

Claim 1 is also believed to be allowable over the combination of Maru, Ito, Keskula and Sederquist, as the combination of art fails to teach or suggest all limitations of claim 1.

Claim 42 depends from claim 1, and therefore incorporates the limitations of claim 1. Accordingly, claim 42 is believed to be allowable over the combination of art proposed in the rejection.

Issue # 6:

Claims 1 and 33 have been rejected under 35 USC 103(a) as being unpatentable over Holladay (US7077643, hereinafter "Holladay") in view of Ito and in yet further view of Keskula.

*Group #1: Claims 1, 33*



In the final office action mailed August 5, 2008, claims 1 and 33 were rejected under 35 USC 103(a) as being unpatentable over Holladay in view of Ito and in yet further view of Keskula. [NOTE: Keskula is not introduced into the rejection until the last paragraph of p. 8 of the final office action.]

In Appellants' response filed Oct. 3, 2008, arguments were presented.

In the Advisory Action mailed Oct. 31, 2008, the Examiner maintained the rejection.

In the rejection, the Examiner again relies on Keskula (US2004/0151955) to show the claimed "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack".

However, as clearly shown in Keskula Fig. 1 and paragraphs 0035-0037, the heating element 52 is in the combustor 34. Effluent from the combustor is used to heat the heat exchanger 14, and then is dumped to the atmosphere. The heat exchanger in turn heats the catalyst of the fuel processor for enhancing the formation of hydrogen gas from feed materials 6 and 8, which is in turn sent to the fuel cell 22 via line 20.

Accordingly, Keskula's heater is not positioned along a fuel path at a point upstream from the fuel cell stack, as claimed. Rather, Keskula's heater is in a combustor out of the fuel path, the effluent of which is used to heat a *heat exchanger* along the fuel path. Thus, not all elements are taught or suggested in the prior art, and the rejection is improper as violating the third prong of the *Graham* test.

In the Advisory Action mailed Oct. 31, 2008, the Examiner argues that Keskula's heater (Keskula Fig. 1, element 52) heats the combustor 48, the heat from which is used to heat the incoming fuel, and thus is located along a fuel path. Appellants respectfully disagree, and assert that the Examiner fails to consider the plain language of claim 1. Claim 1 requires "an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack." Keskula fails to disclose an electric heater in the claimed position.

Consider the following annotated Fig. 1 from Keskula, in which the heating element 52 has been denoted and arrows drawn along the fuel path. Note that the heating element 52 is not along the fuel path. Rather, the heating element 52 is in the combustor 34. Effluent from the combustor is used to heat the heat exchanger 14, and then is dumped to the atmosphere. The heat

FIG. 1

ELECTRIC HEATING ELEMENT (52)

In the rejection, the Examiner states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to add an electric heater and combustor along

the fuel passage of Maru modified by Ito for the benefit of vaporizing the fuel prior to entering the reformer. However, as is clear from Keskula, the purpose of the combustor is to burn fuel. Note Keskula burns MeOH in the combustor, as well as uses MeOH to generate the fuel by catalytic reaction. If Maru's fuel were drawn through Keskula's combustor, the fuel would burn up into combustion byproducts that Maru's reforming catalyst 8 would probably not be able to convert (or "reform") into sufficient quantities of hydrogen.

Accordingly, the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, and there is no suggestion or motivation to make the proposed modification. *In re Gordon, supra*. Thus, the rejection fails the first prong of the *Graham* test.

Claim 33 depends from claim 1 and so is also believed to be allowable based on its dependence.

Issue # 7:

Claims 43 and 44 have been rejected under 35 USC 103(a) as being unpatentable over Maru in view of Ito and in yet further view of Keskula and in still yet further view of Shioya (US6777118, hereinafter "Shioya").

*Group #1: Claims 43-44*

The rejection applies Maru, Ito and Keskula as for claim 1. As discussed in detail above, the rejection of claim 1 based on Maru, Ito and Keskula is improper, and therefore the deficiency renders the present rejection improper as well.

Claim 1 is also believed to be allowable over the combination of Maru, Ito, Keskula and Mallari, as the combination of art fails to teach or suggest all limitations of claim 1.

Claims 43 and 44 depend from claim 1, and therefore incorporate the limitations of claim 1. Accordingly, claims 43 and 44 are believed to be allowable over the combination of art proposed in the rejection.

In view of the remarks set forth hereinabove, all of the independent claims are deemed allowable, along with any claims depending therefrom.

## VIII CLAIMS APPENDIX (37 C.F.R. § 41.37(c)(1)(viii))

The text of the claims involved in the appeal is set forth below:

1. An apparatus comprising:
  - a fuel cell stack having a pair of electrodes including an anode and a cathode, and a thin film solid oxide electrolyte disposed therebetween;
  - a manifold coupled to the fuel cell stack for conveying a fuel to the fuel cell stack;
  - a fuel processor, coupled to the manifold and having:
  - a substrate support including at least one channel, and
  - a catalyst for reforming the fuel; and
  - an electric heater positioned in at least one location selected from: between the electrodes, and along a fuel path at a point upstream from the fuel cell stack for heating the fuel prior to the fuel reaching the fuel cell stack.
2. The apparatus of claim 1, wherein a distance between at least one of the anode and the cathode and the catalyst is less than 10 millimeters.
3. The apparatus of claim 2, wherein the distance is less than 1 millimeter.
4. The apparatus of claim 1, wherein the catalyst contacts at least one of the pair of electrodes.
5. The apparatus of claim 1, wherein the catalyst contacts the anode.
6. The apparatus of claim 1, wherein the catalyst is disposed in at least a portion of the substrate support.
7. The apparatus of claim 1, wherein the fuel cell stack, the manifold, and the fuel processor together comprise a volume less than 1 liter.

8. The apparatus of claim 1, wherein the electrolyte has a thickness less than 10 micrometers.
9. The apparatus of claim 1, wherein the catalyst has a first temperature and the electrolyte has a second temperature during operation of the apparatus, and a difference between the first temperature and the second temperature is less than 200 degrees Celsius.
10. The apparatus of claim 9, wherein at least a portion of the manifold has a third temperature during operation, and a difference between the first temperature and the third temperature is less than 200 degrees Celsius and a difference between the second temperature and the third temperature is less than 200 degrees Celsius.
11. The apparatus of claim 1, wherein the manifold includes at least one wall comprising silicon.
12. The apparatus of claim 1, wherein the manifold comprises a flow passage having at least one dimension less than 5 millimeters.
13. The apparatus of claim 1, wherein a substrate defines the manifold.
28. The apparatus of claim 1, wherein the fuel processor comprises a combustor with the catalyst disposed therein.
29. The apparatus of claim 1, wherein the catalyst is disposed within the at least one channel.
31. The apparatus of claim 1, wherein the fuel processor further comprises a porous catalytic membrane disposed adjacent the manifold.

32. The apparatus of claim 1, wherein the manifold comprises the support substrate integrated with the fuel processor.

33. The apparatus of claim 1, further comprising a combustor thermally coupled to the fuel processor, wherein the combustor disposed on the fuel processor and provides sufficient heat for the catalyst to reform the fuel.

34. The apparatus of claim 1, further comprising a combustor thermally coupled to the fuel processor, wherein during operation of the apparatus the combustor has a first temperature and the catalyst has a second temperature, and the combustor is thermally coupled to the fuel processor for the difference between the first temperature and the second temperature to be less than about 200 degrees Celsius.

35. The apparatus of claim 1, further comprising a combustor thermally coupled to the fuel processor, wherein the combustor includes a catalyst material.

36. The apparatus of claim 35, wherein the combustor includes at least one combustor channel and the catalyst material is positioned within the combustor channel.

37. The apparatus of claim 1, further comprising a combustor thermally coupled to the fuel processor, wherein the combustor includes a channel for combining fuel and oxidant and generating heat.

38. The apparatus of claim 1, further comprising a combustor thermally coupled to the fuel processor, wherein the combustor further comprises an electric heater.

39. The apparatus of claim 1, wherein the manifold comprises an etched silicon-containing substrate.

40. The apparatus of claim 1, wherein the substrate support is comprised of at least one of glass, ceramic, metal, or silicon.

41. The apparatus of claim 1, wherein the at least one channel has a diameter of between about 100 micrometers and about 2 millimeters.

42. The apparatus of claim 1, wherein the catalyst includes at least one of PtRu, CuO, Cu-ZnO, alumina, and Ni.

43. The apparatus of claim 1, wherein the electric heater is a resistive heater.

44. The apparatus of claim 43, wherein the resistive heater is a thin film heater.

47. The apparatus of claim 1, wherein the electrolyte has a thickness less than 10 micrometers, wherein the substrate is comprised of at least one of glass, ceramic, metal, or silicon, and further comprising a combustor thermally coupled to the fuel processor, wherein the combustor further comprises an electric heater.



**IX EVIDENCE APPENDIX (37 C.F.R. § 41.37(c)(1)(ix))**

There is no such evidence.

**X RELATED PROCEEDING APPENDIX (37 C.F.R. § 41.37(c)(1)(x))**

N/A

In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 971-2573. For payment of any additional fees due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account No. 50-1351 (Order No. LLNLP006).

Respectfully submitted,

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